REPORT

ON THE

QUALITY OF THE MILK SUPPLY

OF THE

METROPOLITAN DISTRICT.

BY

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REPORT ON THE QUALITY OF THE MILK-SUPPLY DURING THE YEAR 1869.

COLONEL EMMONS CLARK, *Secretary of the Metropolitan Board of Health.*

SIR: The investigations with regard to the quality of the milk-supply in the Metropolitan District, which were undertaken at the suggestion of Dr. Harris, the Sanitary Superintendent, have been continued during the past year, and I announce with great satisfaction that thus far no adulterant has been detected except water.

I.—PURE MILK.

Milk consists of water holding *in solution* casein or cheese, lactine or sugar of milk, and various alkaline and earthy salts; and *in suspension*, fatty matter, butter, in the form of myriads of semi-opaque globules, to which the color and opacity of milk are due.

1. *The Average Composition of Pure Milk, according to Dr. Letheby, is:*

Water	86.00
Butter	3.90
Casein	4.10
Sugar	5.20
Salts	0.80
	100.00

2. *Complete Analysis of Milk by Haidlen.*

Water	87.30
Butter	3.00
Casein	4.82
Sugar	4.39
Phosphate of Lime	0.230
Phosphate of Magnesia	0.042
Phosphate of Iron	0.007
Chloride of Potassium	0.144
Chloride of Sodium	0.024
Soda, combined with Casein	0.042
	100.00

The specific gravity varies from 1.023 to 1.032, pure water being 1.000 The reaction is generally faintly alkaline.

The composition of milk is, however, affected by a variety of circumstances,

as the breed of the cow, her age, the age of her calf, nature of her food, time of milking, frequency of milking; and it is even found that the last milk which comes down at a milking is richer in butter than that which is first drawn. This last-mentioned fact shows that the custom which prevails in some localities of driving the cow from house to house, and supplying the consumer with milk fresh from the udders is not quite equitable, as the last person supplied receives a richer milk than is given to the first customer.

The following analyses illustrate these statements:

3. *Milk from Different Breeds of Cows. Analyses by Vernois et Becquerel.*

Breed.	Water.	Butter.	Casein.	Sugar.	Salts.
Angus	80.32	9.88	5.28	3.73	0.72
Belgian—Durham	85.77	6.22	4.06	3.29	0.67
Bohemian	84.18	6.34	3.87	4.96	0.64
Bretonne	83.74	5.70	5.37	4.55	0.62
Charollais	85.28	6.42	4.12	3.49	0.68
Durham, two analyses	84.56	6.41	4.37	3.97	0.68
Flamande	88.30	3.72	3.37	4.03	0.54
Dutch, three analyses	83.97	6.84	4.21	4.35	0.61
Murzthal	85.31	6.28	3.14	4.62	0.64
Normandy	87.18	3.24	4.76	4.21	0.60
Paris, thirty analyses	86.40	3.61	5.21	4.10	0.66
Swiss	85.19	7.08	2.55	4.59	0.56
Tyrol	81.74	7.96	4.95	4.82	0.50
Voigtland	84.99	5.14	4.56	4.62	0.68
Average, 46 analyses	85.76	4.51	4.86	4.15	0.65

4. *Effect of Food on the Quality of Milk. Analyses by Chevalier.*

	Carrots.	Beets.
Water	86.67	86.87
Butter	3.08	2.75
Casein	4.20	3.75
Sugar	5.30	5.95
Salts	0.75	0.68
	100.00	100.00

5. *Difference in Morning and Evening Milk. Averages of many Analyses by Alex. Müller.*

	Morning.	Evening.
Water	87.43	86.87
Butter	3.77	4.32
Casein	3.40	3.44
Sugar	4.67	4.66
Salts	0.73	0.71
	100.00	100.00

Methods of Analysis.

1. The water is determined by evaporating a weighed quantity of milk, either alone or soaked up in a known weight of pure, fine quartz sand. The residue is carefully dried at 212° F., and weighed. The loss in weight represents the water, while the residue includes all the solid constituents.

2. The salts are determined by carefully burning off the combustible portion

of the solid residue obtained by evaporation, and weighing the incombustible ash.

3. The butter and casein are determined by coagulating the milk with a few drops of acetic acid, boiling, washing the precipitate with water, and finally separating the butter with ether, leaving the casein pure. On evaporating the ether, the butter is left behind, or the butter may be extracted by ether from the residue obtained by the evaporation of a quantity of milk, soaked up in sand.

4. The sugar is generally determined by deducting the sum of the other constituents from 100. It may be directly determined by the polariscope, after the removal of the casein and butter, or it may be determined by an alkaline solution of copper.

II.—THE ADULTERATION OF MILK.

Numerous substances are mentioned as having been used, or as supposed to be used, for adulterating milk. Prominent among these are:

1. *Water.*—Adulteration with this substance is generally detected by the specific gravity of the milk. Pure milk varies in specific gravity from 1.023 to 1.034, water being represented by 1.000. Milk is heavier than water, on account of the casein, sugar, and salts, which it holds in solution. Butter, on the other hand, is lighter than water, therefore the specific gravity of milk increases with the percentage of casein, sugar, and salts, while it diminishes with the percentages of water or butter. It is found that good milk generally has a specific gravity of from 1.029 to 1.032. In testing milk the lower number is selected as a fair gravity for pure milk; and whenever the gravity falls below this number the milk may be considered as containing an excess of water, and consequently poor in quality or adulterated. An instrument, called a galactometer, has been devised by Dinocourt, for the purpose of testing the quality of milk. It is simply an areometer, so graduated that 100 on the scale represents pure milk, or the gravity 1.029, while 0 represents pure water or gravity 1.000, the space between being divided into 100 parts. The numbers on the scale represent, therefore, the percentages of pure milk.

Skimmed milk, having been deprived of most of its butter, is heavier than whole milk. By skimming the milk before testing it with the galactometer, the error caused by the butter is eliminated. In this case, however, the mark for 100, or pure milk, must be placed lower down on the instrument, as pure milk, having a specific gravity of 1.029, would after being skimmed, have a gravity of about 1.033. The 100° mark for skimmed milk is, therefore, fixed at this point.

The *lactometer* is a simple tube closed at the lower end, and graduated in hundredths. It is designed to measure the quantity of cream which rises on the milk.

By using the two instruments together, the *galactometer* and the *lactometer*, very satisfactory conclusions with regard to the quality of milk can be formed. A perfectly reliable method, though more laborious, is to actually determine the percentage of water in the milk, by evaporating a weighed quantity, and carefully drying the residue at 212° F. If a milk loses more than 88 per cent. of

water, having less than 12 per cent. of solids, it may be safely pronounced to be adulterated with water.

2. *Chalk.*—This substance is generally supposed to be extensively used to neutralize the acidity in soured milk, and to produce thickness and opacity, thus concealing dilution with water. It is easily detected, as it is deposited on standing, and can then be recognized by its effervescing with dilute acids. I have never detected it in any sample of milk examined. Its presence would also be shown in a milk analysis, by the unusual amount of ash.

3. *Flour, starch, emulsions of almonds, or hemp-seed, etc.*, are said to be used to thicken milk, and neutralize the blue color caused by dilution. They were not found in any of our samples.

4. *Sugar, gum, dextrin and borax*, to increase specific gravity.

5. *Turmeric and annatto*, to hide the blue color.

6. *Cerebral matter, sheep's brains*, to thicken watered milk, easily detected by the microscope, and by its depositing a peculiar white sediment on standing.

7. *Carbonate or bicarbonate of soda*, to neutralize acidity. Detected by the increase in the quantity of ash, or better by the effervescence of the ash with acids.

III.—THE MILK SUPPLIED TO CONSUMERS IN THE METROPOLITAN DISTRICT

Two hundred and ninety-seven specimens of the milk supplied to consumers in the Metropolitan District have been submitted to chemical examination. Of these forty-five were seized while undergoing the process of dilution with water, two hundred and forty-five were purchased from the retail dealers, and seven were procured at one of the crowded cow-stables in Brooklyn.

First Series of Analyses.—In the latter part of February, some milkmen were detected in the act of pouring a suspicious fluid, contained in milk-cans, into their milk. They were at once arrested, and taken, with their cans, about fifty in number, to police headquarters. Samples from forty-five of the cans, which were placed in my hands for examination, gave the following results:

Two cans contained water, not any too pure.

Two cans contained water, clouded with a little milk, probably from having been pumped into cans which had contained milk.

Four cans contained water to which considerable milk had been added, the specific gravity varying from 1.010 to 1.017, representing by the galactometer from 37 to 60 per cent. of milk.

Nineteen cans contained milk, to which considerable water had been added, the specific gravity varying from 1.023 to 1.028, representing from 80 to 97 per cent. of milk.

Eighteen cans contained pure milk, varying in specific gravity from 1.029 to 1.030.

None of the samples contained any adulterant save water. The large proportion of pure milk is accounted for by the fact that the work of dilution was interrupted by the police.

Second Series of Analyses.—During the months of June and July a systematic examination of milk was organized, the samples being purchased from re-

tail dealers in various portions of the Metropolitan District. Two hundred and ten samples were analyzed, the following determinations being made in each case :

1. The specific gravity.
2. The percentage of pure milk as shown by the galactometer.
3. The percentage of water.
4. The percentage of solid matter, including butter, casein, sugar of milk, saline constituents, etc.
5. Examination for adulterations.

The results are herewith presented in tabular form, and from them we learn the following facts :

1. The specific gravity varies from 1.010 to 1.032, averaging 1.0208.
2. The percentage of pure milk, as shown by the galactometer, ranges from 37 to 110, averaging 72½.
3. The percentage of water varies from 83.57 to 94.17, averaging 89.89.
4. The percentage of solid constituents, the nutritive portion of the milk, varies from 5.83 to 16.43 per cent., averaging 10.11
5. No adulteration was found in a single instance, save water.

Table I.—Milk Examinations during June and July, 1869.

DEALER.	ADDRESS.	Specific Gravity.	Percentage of Milk by Galactometer.	Percentage of Water by direct Weight.	Total Solids—Butter, Casein, Sugar, etc. Dried at 212° F.
—— McSwyny	497 Pearl Street	.....	.....	87.79	12.21
.....	14 Franklin	1.029	98	90.14	9.86
D. & A. Boseke	61 Baxter	1.029	98	82.42	17.58
Chas. Doscher	13 Mott	1.032	106	88.80	11.10
.....	71 Park Place	1.029	98	88.12	11.88
Wm. Moller & Son	524 Pearl	1.020	70	91.18	8.82
C. A. Emmet	21 Mott	1.025	86	89.68	10.32
Daniel Sullivan	67 Park Street	1.025	86	88.33	11.67
D. Driscoll	24 City Hall Place	1.020	70	89.00	11.00
Mrs. Horsey	136 Leonard	1.020	70	88.11	11.89
Gallighan Bros.	119 Mulberry	1.025	86	87.84	12.16
J. J. Geaby	22 Mulberry	1.025	86	89.41	10.59
Schreider & Wilken	115 Baxter	1.025	86	86.17	13.83
J. Dellart	40 Eldridge	1.025	86	85.22	14.78
J. Seeldy	36 Park	1.022	76	86.71	13.29
—— McSwyny	497 Pearl	1.022	76	82.97	17.03
A. Knauer	79 Broome	1.025	86	88.72	11.28
C. W. Dainty	234 Worth	1.025	86	88.38	11.62
H. Pentz	119 Baxter	1.025	86	89.41	10.59
A. Horr	263 Rivington	1.020	70	90.09	9.91
J. F. McDowell	92 Henry	1.026	90	87.72	12.28
F. McKenne	34 Pitt	1.025	86	90.15	9.85
J. McKulloch	Laurel Hill	1.018	63	90.81	9.19
G. Kasselmine	72 Garrick	1.020	70	88.26	11.74
J. McDonald	103 Broome	1.022	76	88.76	11.24
A. Schulingburg	169 Allen	1.025	86	89.01	10.99
J. Wittman	131 E. Houston	1.026	90	88.42	11.58
J. Watjen	34 2d Avenue	1.020	70	89.11	10.89
W. Doyle	79 Ludlow	1.025	86	90.89	9.11
G. Bachmann	51 Ludlow	1.020	70	88.85	11.15
J. Raedig	106 Allen	1.023	80	89.51	10.49
J. M. Oest & Co.	16 2d Avenue	1.023	80	89.12	10.88
Peter Fick	230 6th Avenue	1.025	86	85.55	14.45
D. F. Reck	113 W. 10th	1.025	86	87.79	12.21
F. H. Rohers	58 6th Avenue	1.025	86	87.81	12.29
H. Piefke	18 6th Avenue	1.025	86	88.78	11.22
N. Bremer	4 6th Avenue	1.027	93	88.36	11.64
D. Hopmann	22 Minetta Lane	1.022	76	89.89	10.11

Milk Examinations—(Continued).

DEALER.	ADDRESS.	Specific Gravity.	Percentage of Milk by Galactometer.	Percentage of Water by direct Weight.	Total Solids—Butter, Casein, Sugar, etc. Dried at 212° F.
Wm. Rame	26th Street and 7th Avenue	1.027	93	89.26	10.74
A. Lieberg	257 7th Avenue	1.025	86	87.93	12.07
Russing & Ebert	189 7th Avenue	.....	.....	87.43	12.57
J. McCrady	1344 7th Avenue	1.025	86	87.46	12.54
Wm. J. Acker	21 7th Avenue	1.025	86	88.28	11.72
R. Devans	37 Greenwich Avenue	1.025	86	88.43	11.57
P. Steinmann	105 11th Avenue	1.028	96	87.63	12.37
J. W. Steinbeck	63d Street and 2d Avenue	1.025	86	87.57	12.43
Block & Co	337 54th Street	1.024	83	88.42	11.58
Hermann & Son	1024 2d Avenue	1.022	76	89.18	10.82
—— Cunningham	1008 2d Avenue	1.020	70	89.27	10.73
C. M. Cornell	Astoria	1.020	70	90.14	9.86
—— Futhius	223 E. 53d Street	1.023	80	90.37	9.63
P. Brady	45th Street and Madison Ave.	1.027	93	86.27	13.73
—— McNeal	46th Street and 4th Avenue	1.025	86	83.57	16.43
H. Hallan	338 E. 58th Street	1.020	70	88.90	11.10
E. Thomas	207 E. 36th Street	1.025	86	87.22	12.78
P. Mallach	589 2d Avenue	1.024	83	87.78	12.22
M. Snider	61st Street near 2d Avenue	1.012	44	.....	.....
G. Hammer	57th Street near 5th Avenue	1.025	86	.....	.....
J. B. Murry	57th Street and 7th Avenue	1.020	70	88.27	11.73
B. Schwietering	813 7th Avenue	1.023	80	88.90	11.10
—— Mills	790 7th Avenue	1.025	86	88.27	11.73
—— Dillinger	412 W. 50th Street	1.027	93	88.64	11.36
J. Bohde	824 2d Avenue	1.025	86	89.60	10.40
C. H. Steinkamm	863 2d Avenue	1.023	80	88.10	11.90
F. Buse	765 2d Avenue	1.020	70	90.25	9.75
Powell & Co	681 2d Avenue	1.022	76	89.62	10.38
H. Claussen	648 2d Avenue	1.027	93	88.74	11.26
F. Kriete	82 7th Avenue	1.019	66	91.25	8.75
Bussing & Ebert	189 7th Avenue	1.022	76	88.98	11.02
P. L. Hulle	721 9th Avenue	1.020	70	90.85	9.15
P. Brahnburg	683 9th Avenue	1.023	80	89.36	10.64
—— Bucklage	628 9th Avenue	1.018	63	90.02	9.98
—— Maxwell	558 9th Avenue	1.018	63	90.82	9.18
J. Bernhard	469 9th Avenue	1.025	86	88.47	11.53
R. Doty	315 9th Avenue	1.018	63	92.04	7.96
Browning & Berry	183 9th Avenue	1.025	86	88.33	11.67
Wessel & Puckley	2 9th Avenue	1.025	86	88.79	11.21
H. H. Krogan	518 10th Avenue	1.020	70	89.73	10.27
—— Fight	500 10th Avenue	1.012	44	93.25	6.75
M. Schnied	368 10th Avenue	1.017	60	90.31	9.69
D. Hunkey	327 10th Avenue	1.018	63	90.70	9.30
E. Ryan	263 10th Avenue	1.018	63	91.00	9.00
—— Hunker	242 10th Avenue	1.023	80	91.54	8.46
J. O. Sullivan	153 10th Avenue	1.013	47	92.26	7.74
J. Ruter	770 Greenwich	1.014	50	91.41	8.59
P. Hohre	744 11th Avenue	1.015	53	92.32	7.68
—— Murray	673 4th Avenue	1.021	73	91.07	8.93
P. Swick	609 10th Avenue	1.017	60	91.16	8.84
—— Plunket	517 10th Avenue	1.031	103	85.47	14.53
A. Marquart	422 10th Avenue	1.014	83	90.22	9.78
P. O. Sullivan	153 10th Avenue	1.015	53	92.39	7.61
Austin Yearks	118 9th Avenue	1.022	76	89.92	10.08
F. Panaxtre	160 8th Avenue	1.016	56	91.61	8.39
John Maurer	997 1st Avenue	1.023	80	89.73	10.27
H. Berns	839 1st Avenue	1.021	73	91.02	8.98
H. Rick	815 1st Avenue	1.017	60	91.47	8.53
C. H. Katter	547 1st Avenue	1.016	56	91.99	8.01
H. D. Bruns	445 1st Avenue	1.020	70	91.36	8.64
P. D. Cordes	429 1st Avenue	1.017	60	90.58	9.42
John M. Oest	383 1st Avenue	1.020	70	90.60	9.40
F. Purdy	319 1st Avenue	1.020	70	90.21	9.79
John Spielmann	222 1st Avenue	1.015	53	91.64	8.36
—— Oppenheimer	201 1st Avenue	1.020	70	90.29	9.71
Henry Klenke	146 1st Avenue	1.020	70	90.43	9.57
D. Klenke	115 1st Avenue	1.019	66	90.54	9.46
A. Schulz	96 1st Avenue	1.023	80	90.70	9.30
David Roemer	60 1st Avenue	1.015	53	91.72	8.28
Henry Malsey	26 1st Avenue	1.015	53	92.09	7.91
A. Schulte	11 1st Avenue	1.018	63	90.80	9.20
John Thiel	207 Avenue A	1.015	53	91.93	8.07
Chas. Mincum	147 Avenue A	1.017	60	91.20	8.80
F. Ebenger	149 Avenue A	1.015	53	92.03	7.97
John Hoopner	41 Avenue A	1.018	63	93.08	6.92

Milk Examinations—(Continued).

DEALER.	ADDRESS.	Specific Gravity.	Percentage of Milk by Galactometer.	Percentage of Water by direct Weight.	Total Solids—Butter, Casein, Sugar, etc. Dried at 212° F.
H. & P. Theil	22 Avenue A	1.012	44	92.61	7.39
Mrs. Surman	175 Suffolk	1.018	63	91.14	8.86
Henry Bartell	16 Suffolk	1.020	70	90.70	9.30
—— Behyl	166 Avenue B	1.014	50	92.26	7.74
Meyer & Co	94 Avenue B	1.018	63	91.48	8.52
—— Corkersburg	64 Avenue B	1.020	70	89.70	10.30
Christ. Siles	32 Avenue B	1.015	53	92.77	7.23
Peter Bäker	11 Avenue B	1.020	70	92.76	7.24
P. Ahleim	203 Avenue C	1.014	50	92.60	7.40
John Ricken	174 Avenue C	1.014	50	92.92	7.08
	107 Avenue C	1.015	53	91.46	8.54
Riese & Brother	69 Avenue C	1.015	53	92.04	7.96
Will. Barkler	14 Avenue C	1.015	53	92.31	7.69
J. Cabbenger	6 Avenue C	1.012	44	94.17	5.83
John Holsten	79 Pitt	1.015	53	93.43	6.57
Peter Kooney	54 Pitt	1.015	53	91.80	8.20
H. Kinkan	74 Avenue D	1.015	53	91.80	8.20
F. Brohel	22 Avenue D	1.015	53	92.35	7.65
A. Moeller	16 Avenue D	1.010	37	93.41	6.59
P. Schmidt	101 Columbia	1.013	47	91.85	8.15
Otto H. Coop	74 Columbia	1.020	70	88.98	11.02
Will. Katgin	365 3d Avenue	1.010	37	93.03	6.97
H. Devender	245 3d Avenue	1.012	44	93.08	6.92
L. Balor	415 3d Avenue	1.013	47	92.29	7.71
C. Fisher	478 3d Avenue	1.015	53	90.82	9.18
J. G. Gerdes	557 3d Avenue	1.013	47	91.95	8.05
D. H. Schulz	605 3d Avenue	1.015	53	91.13	8.87
G. E. Wehmann	40 Franklin	1.015	53	91.00	9.00
H. F. Cordes	39 Elm	1.019	66	90.35	9.65
H. Tienchen	66 W. Broadway	1.015	53	91.40	8.60
H. F. Newman	7 Harnson	1.025	86	89.73	10.27
Ph. Fewriug	93 Elm	1.018	63	89.31	10.69
W. Smith	165 Avenue A	1.028	96	88.53	11.47
F. Intemann	353 Greenwich	1.022	76	88.87	11.13
—— Newrenberg	1 Lispenard	1.026	90	89.10	10.90
L. Walker	139 W. Broadway	1.022	76	90.08	9.92
D. Stowesand	97 W. Broadway	1.026	90	89.10	10.90
—— Wisschusen	16 York	1.022	76	90.08	9.92
John Moss	33 Leonard	1.025	86	88.80	11.20
J. Balch	133 Greenwich	1.022	76	90.68	9.32
M. Hertily	26 Rector	1.024	83	89.32	10.68
J. P. Koplic	145 Greenwich	1.025	86	88.00	12.00
C. Maerbeck	135 Liberty	1.024	83	88.63	11.37
P. Flynn	151 Washington	1.025	86	88.02	11.98
G. F. Broggensen	91 Greenwich	1.020	70	90.77	9.23
J. McDonald	19 Albany	1.022	76	89.30	10.70
—— Wette	Carlisle and Washington	1.025	86	89.84	10.16
D. McCarthey	8 Morris	1.020	70	90.33	9.67
K. E. Enright	12 Greenwich	1.021	73	91.29	8.71
J. H. Gentzen	28 Greenwich	1.024	83	88.40	11.60
M. Henken	40 Greenwich	1.023	80	87.80	12.20
M. Kelly	4 Morris	1.016	56	91.54	8.46
Michael Landy	29 Washington	1.020	70	89.87	10.13
Michael O'Connor	71 Washington	1.015	53	91.56	8.44
Philip Shelan	24 Morris	1.022	76	88.95	11.05
Mrs. Pritching	401 E. 18th Street	1.018	63	91.53	8.47
—— Jaggart	342 1st Avenue	1.021	73	88.53	11.47
J. M. Oest	303 1st Avenue	1.020	70	90.67	9.33
A. Spielmann	220 1st Avenue	1.020	70	89.84	10.16
C. Wolfart	275 1st Avenue	1.022	76	89.11	10.89
D. Leopold	402 2d Avenue	1.025	86	89.74	10.26
A. Kneble	318 E. 22d Street	1.020	70	89.42	10.58
J. C. Reisen	407 E. 19th Street	1.018	63	90.01	9.99
L. Remshardt	206 Avenue A	1.024	83	88.93	11.07
Patrick O'Connor	224 Avenue A	1.021	73	90.28	9.72
J. Pentar	512 E. 15th Street	1.023	80	89.18	10.82
J. Haukamp	227 E. 21st Street	1.024	83	88.97	11.03
E. Wehrenberg	361 2d Avenue	1.020	70	89.53	10.47
P. W. Sanders & Co	258 Avenue A	1.024	83	88.07	11.93
C. F. Wilken	273 Avenue A	1.023	80	89.11	10.89
J. Priede	323 Avenue A	1.015	53	90.51	9.49
Peter Peterson	231 Avenue B	1.019	66	90.18	9.82
F. Fippinger	546 E. 11th Street	1.020	70	89.10	10.90
J. Beek	509 E. 11th Street	1.018	63	90.47	9.53
F. Ebinger	149 Avenue A	1.016	56	89.99	10.01

Milk Examinations—(Continued).

DEALER.	ADDRESS.	Specific Gravity.	Percentage of Milk by Galactometer.	Percentage of Water by direct Weight.	Total Solids—Butter, Casein, Sugar, etc. Dried at 212° F.
H. Wesemans	286 E. 10th Street	1.020	70	89.71	10.29
P. Lahr	341 E. 10th Street	1.023	80	88.45	11.55
H. A. Stegeman	352 E. 10th Street	1.017	60	90.41	9.59
A. Ritz	191 E. 7th Street	1.020	70	88.47	11.53
William Reis	410 E. 6th Street	1.021	73	89.71	10.29
M. Moser	433 E. 6th Street	1.023	80	89.92	10.08
C. Hartungs	437 E. 6th Street	1.025	86	89.28	10.72
C. D. Schupp	502 E. 6th Street	1.023	80	90.07	9.93
Geo. Siemon	507 E. 6th Street	1.021	73	90.00	10.00
C. Hitzel	520 E. 5th Street	1.024	83	89.07	10.93
F. Lautenschleuger	203 E. 4th Street	1.021	73	89.66	10.34
J. Schultz	154 E. 4th Street	1.024	83	89.48	10.52
J. Heubner	41 Avenue A	1.021	73	90.21	9.79
Geo. Finkles	102 E. 3d Street	1.022	76	90.41	9.59
J. Weber	193 E. 3d Street	1.024	83	88.59	11.41
Chris. Silz	32 Avenue B	1.023	80	89.79	10.21
L. A. Betsch	166 E. 3d Street	1.025	86	89.48	10.52
G. Deible	212 E. 3d Street	1.024	83	89.49	10.51
A. Reichert	152 E. 3d Street	1.021	73	90.78	9.22
J. Lang	5 Clinton Street	1.024	83	89.53	10.47
Average		1.0208	72.45	89.89	10.11

Third Series of Analyses.—During the last four months of the year, a series of more elaborate analyses was undertaken, with a view to determine the percentages of some of the individual constituents of the milk. Thirty-five samples were examined, and the results, which are herewith presented in tabular form, establish the fact that—

1. The cream averaged 7.89 per cent., ranging from 5.20 to 11.80 per cent.

2. The percentage of pure milk, as shown by the galactometer, averaged 82.44, varying from 50 to 112.

3. The butter averaged 3.03 per cent., varying from 1.81 to 3.76.

4. The casein and milk-sugar together averaged 6.46 per cent., ranging from 4.16 to 9.02.

5. The saline and earthy constituents averaged 0.59 per cent., varying from 0.39 to 0.87 per cent.

6. The total solids averaged 10.08 per cent., ranging from 6.73 to 12.32 per cent.

7. The water averaged 89.92 per cent., ranging from 87.68 to 93.27 per cent.

8. No adulteration was found in any case save water.

Table II.—Milk Examinations during the last Four Months of 1869.

DATE.	DEALER.	ADDRESS.	Reaction.	Cream.	Percentage of Milk by Galactometer.	Butter.	Casein and Sugar.	Salts.	Total Solids.	Water.
September 22	—— Thiel	20 Avenue A			72	2.68	6.12	0.57	9.37	90.63
" 22	—— Roth	81 Avenue A			73	2.25	5.87	0.53	8.65	91.35
" 22	—— Dorsch	122 E. 7th Street			64	2.62	4.91	0.57	8.10	91.90
" 22	A. Ritler	223 Houston			66	2.09	5.74	0.53	8.36	91.64
" 23		Rockland County		8.5	80	3.25	6.32	0.65	10.22	89.78
" 24	Taylor's Saloon	355 Broadway		8.5	112	2.43	9.02	0.87	12.32	87.68
" 27	C. A. Kelley	105 Avenue C		7.8	50	2.18	4.16	0.39	6.73	93.27
" 27	Riesse Bros	69 Avenue C		6.8	68	2.67	5.57	0.51	8.75	91.25
" 27	—— Barkley	14 Avenue C		6.6	71	2.26	5.97	0.52	8.75	91.25
" 27	—— Jean	265 2d Street		6.6	75	2.82	5.84	0.59	9.25	90.75
October 4	—— Maloney	210 E. 6th Street		7.3	69	3.11	5.90	0.54	9.55	90.45
" 4	—— Busch	213 E. 6th Street		6.2	87	3.05	6.76	0.71	10.52	89.48
" 4	—— Lubkin	233 Bowery		5.2	79	2.91	6.68	0.62	10.21	89.79
" 4	—— Sunken	20 Bleecker		5.3	86	1.81	7.26	0.66	9.73	90.27
" 30	Jacob Stein	Mott and Spring	Neutral.	6.3	86	3.76	6.34	0.65	10.75	89.25
" 30	A. Tienken	297 Mott	Sl. Acid.	7.8	85	2.24	7.35	0.64	10.23	89.77
" 30	Henry Claus Fayen	73 E. Houston	Sl. Acid.	6.5	96	3.02	7.32	0.69	11.03	88.97
November 2	A. Hadden	236 E. 24th Street	Sl. Acid.	12.8	97					
" 17	Michael McBride	194½ Greene	Sl. Acid.	8.6	72	3.21	6.43	0.50	10.14	89.86
" 17	Mary Felicine	209 Greene	Sl. Acid.	8.3	86	3.32	7.16	0.63	11.11	88.89
" 17	Marcus Martins	197 Greene	Sl. Acid.	6.1	78	3.01	6.24	0.59	9.84	90.16
" 17	Henry Seeberck	157 Greene	Sl. Acid.	8.1	70	3.54	5.76	0.54	9.84	90.16
" 27	Hermann Drewes	226 Chrystie	Sl. Acid.	8.3	100	3.69	7.49	0.67	11.85	88.15
" 27	John Whittman	131 E. Houston	Sl. Acid.	8.0	95	3.12	7.77	0.63	11.52	88.4
" 27	Albert Schulte	11 1st Avenue	Sl. Acid.	6.1	90	2.50	7.32	0.61	10.43	89.57
" 27	John D. Schmidt	185 E. Houston	Sl. Acid.	9.8	90	2.87	8.10	0.62	11.59	88.41
December 11	William Kaltenbach	178 Essex	Sl. Acid.	8.9	97	3.21	7.37	0.63	11.21	88.79
" 11	Hermann Pflug	175 Essex	Sl. Acid.	8.0	96	3.28	7.80	0.63	11.71	88.29
" 11	John Geiss	160 Essex	Neutral.	9.8	82	3.34	6.56	0.52	10.42	89.58
" 11	Christian Schaefer	129 Stanton	Acid.	9.9	88	3.02	6.76	0.58	10.36	89.64
" 16	Michael Reinhardt	217 Stanton	Acid.	8.0	89	2.62	7.17	0.62	10.41	89.59
" 16	Christian Kurtz	96 Willet	Sl. Acid.	9.3	72	2.87	5.83	0.47	9.17	90.83
" 16	Philip Thomas	101 Willet	Sl. Acid.	6.1	100	3.26	7.74	0.67	11.67	88.33
" 16	Jacob Weymar	118 Willet	Sl. Acid.	11.1	82	2.36	6.37	0.49	9.22	90.78
	Average			7.89	82.44	3.03	6.46	0.59	10.08	89.92

Fourth Series of Analyses.—During the month of April, the attention of the Board having been called to the crowded condition of some of the large cow-stables in the Metropolitan District, the Sanitary Superintendent, Dr. Harris, was directed to make an investigation. It was found on examination that, although the stables were over-crowded, dark, and damp, and deficient in ventilation, the animals generally presented a good appearance.

Seven samples of milk were collected and submitted to analysis, with the following results:

	Water.	Butter.	Casein and Sugar.	Salts.
No. 1	90.00	1.31	8.00	0.69
" 2	89.02	2.16	8.10	0.72
" 3	88.88	2.41	7.62	0.79
" 4	88.18	2.54	8.50	0.78
" 5	88.09	2.32	8.75	0.84
" 6	88.48	1.51	9.20	0.81
" 7	89.20	0.84	9.19	0.77
Average	88.85	1.87	8.48	0.77
Healthy Milk	86.00	3.90	9.30	0.80

It appears that the milk of these cows is specially deficient in butter, though it is in *every* respect poorer than the milk of healthy cows. No other indications of disease could be detected in the milk.

The blood of three of these cows was also analyzed, with the following results—the 4th column is an analysis of healthy blood:

	1.	2.	3.	4.
Water	799.81	801.35	843.12	779.06
Fibrin	4.91	5.94	7.63	4.39
Albumen	104.90	69.37	85.22	60.02
Corpuscles	81.10	101.13	51.33	146.50
Extractive	0.95	3.68	6.40	3.20
Soluble Salts	8.33	8.53	6.30	7.01
	1,000.00	1,000.00	1,000.00	1,000.00

The blood of the confined cows is strikingly deficient in red corpuscles, and contains from two to six per cent. more water than the healthy blood. It is thus seen that, while these cows present a fair appearance, they are not in a sound, healthy condition; and, though analysis may fail to detect any specific poison, such milk cannot be considered healthy food.

CONCLUSION.

This investigation establishes the fact that the citizens of the Metropolitan District are generally receiving milk which is free from injurious adulterations, and untainted with disease.

Nevertheless, a fraud is perpetrated upon them in the systematic dilution of the milk with water. The average percentage of pure milk in the adulterated

article with which the city is supplied, is 73.28; or, in other words, for every three quarts of pure milk there is added one quart of water. It was stated at the Convention of Milk Producers and Dealers, held at Croton Falls, in March, 1870, that the total amount of milk supplied to the cities of New York and Brooklyn from the surrounding country was about 120,000,000 quarts per annum. To reduce this to the quality of our city supply, requires an addition of 40,000,000 quarts of water, which, at ten cents per quart, costs us the snug sum of $4,000,000 annually, or about $12,000 per day.

I have been aided in this investigation by W. H. Chandler, M. Alsberg, Ph. D., and H. Endemann, Ph. D.

Very respectfully, yours,

C. F. CHANDLER, Ph. D.,

Chemist to the Metropolitan Board of Health.